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The history of human land use *vs* climate impacts on natural environments is of direct relevance in the perspective of future climate change and increasing human pressure on ecosystems. Although these impacts were discrete before agriculture and breeding development, they became critical after the industrial revolution, due to the massive anthropization of terrestrial surfaces. Natural archives such as soils and sediments potentially preserve information about past land uses. As a matter of fact, soils are reputed to retain the signature of their ancient uses [1] and lacustrine sediments integrate the evolution of environmental conditions that prevailed in the catchment basin through time.

Previous results obtained in recent sediments (< 50 years) from Lake Aydat (Massif Central, France) revealed the presence of pentacyclic triterpenes and their derivatives inherited from vegetation and soils [2]. Their reconstructed evolution through time correlates with known anthropic perturbations in the catchment area, such as regrouping of lands or the straightening of the Veyre River, the major tributary of Lake Aydat. These results are substantiated by those acquired from the sediments of Lake Le Bourget (French Alps). Along a sedimentary record that covers the Holocene, the utilisation of TTHC as a tracer of soil erosion confirms the interest of pentacyclic triterpenes and their derivatives for reconstructing past land use [3].

This study aims at deciphering the potential variability of biomarkers imprints in soils depending on vegetation cover and use (forests of *Epicea sp.*, meadows, pastures, farmlands…). The rationale is that the distribution of pentacyclic triterpenes, ubiquist compounds in the Plant Kingdom and found in soils, is controlled by the source vegetation surrounding soils. Then, the physico-chemical conditions that prevail in soils, which in turn control the diagenetic pathways of pentacyclic triterpenes, can be affected by soil use (pasture, rotations, fallows, ploughing techniques…).

A total of 36 soil profiles, representative of the diversity of soil occupation encountered in the catchment of Lake Aydat, were recovered in autumn 2008. Half of the samples were taken along two profiles that are perpendicular to the Veyre River. Each soil profile was vertically subsampled in order to specifically pay attention to soils that underwent a recent change in their use (such as soils under pasture formerly cultivated - as attested by the comparison of aerial pictures taken in 1946 with present day conditions; Fig. 1) in order to estimate the persistence of former biomarker imprints and the impacts of new land use on inherited signatures.

Lipids were extracted from the sub-samples using an Accelerated Solvent Extractor (DIONEX ASE 200) and then separated into three fractions (neutral, acidic and polar compounds) on aminopropyl bonded silica. Neutral lipids were then identified and quantified by gas chromatography - mass spectrometry (GC-MS). Statistical analyses performed on pentacyclic triterpenes and their derivatives allow a primary discrimination between the different soil samples analysed.

Fig. 1. Evolution between 1946 and 2008 of the land lotting around the "Puy de la Rodde" volcano, in the catchment basin of Lake Aydat. These photographs illustrate the strong evolution of land use in the region due to the modifications of agricultural practises. Sources: IGN (1946) and Google Maps (2008).

References

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